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ABSTRACT

A study involving 233 seventh-grade students (123 females and 110 males) attending a metropolitan southeastern Idaho junior high school was conducted to determine predictors of seventh-grade mathematics achievement. The seventh-grade mathematics program consisted of 11 classes of four ability groups. The classes included a pre-Algebra class, four exploring classes, four general classes, and two basic classes. Predictor variables assessed included mathematics scores on the Iowa Tests of Basic Skills (ITBS) and the Kern High School District Test of Mathematics Achievement, sixth-grade mathematics grades teacher recommendations, and gender. Seventh-grade mathematics achievement was measured by student course grades and end-of-the-year achievement test scores. Analyses involved the use of multiple regression techniques. Results show that all variables but the ITBS total mathematics score were significantly correlated with seventh-grade first semester percentage grade. A composite set of eight predictors accounted for approximately 71% of the variance in achievement test scores. Implications for achievement prediction, grading systems, and ability grouping are discussed. Seven data tables are included. (TJH)

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# PPEDICTOPS OF SEVENTH-GRADE MATHEMATICS ACHIEVEMENT

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The National Council of Teachers of Mathematics established the Commission on Standards for School Mathematics in early 1986 to make recommendations for mathematics curriculum in grades K-12. The recommendations included (a) all college-bound students should complete four years of high school mathematics, (b) students planning to take calculus in their senior year should complete a full four years of college preparatory mathematics; necessitating combining seventh and eighth-grade mathematics into one year, and (c) non-college bound students should complete three years of mathematics, one year to be in the senior year of high school (National Council of Teachers of Mathematics, 1989).

These recommendations affect not only the high school mathematics curriculum but also junior high school mathematics. A student's progression through the secondary mathematics curriculum begins in seventh grade. Typically, seventh-grade mathematics is ability grouped including the spectrum from remedial to pre-algebra classes (Oakes, 1985). Therefore, students who have mathematical potential and desire need to be appropriately placed in the pre-algebra class at seventh grade; otherwise, they will not be able to complete calculus in high school without taking two mathematics classes in one

year or attending summer school. Likewise, the average and below average students need to be in a mathematics class which is commensurate with their current mathematical proficiency and which offers the opportunity to remediate any mathematical deficiencies they may have.

Consequently, the problem becomes how do schools appropriately place students in the mathematics sequence at seventh grade? Numerous studies have investigated predictors of future mathematics achievement, but they have largely focused on students of high mathematical ability (Flexer, 1984; Reynolds, 1983) or on the prediction of algebra success (Hanna, Bligh, Lenke, & Orleans, 1969; Siglin & Edeburn, 1978). In view of the recommendation of more high school mathematics for all students and the fact that algebra placement for some students now ocurrs at seventh grade, investigations of the predictors for seventh-grade mathematics achievement are certainly needed and will yield information of both practical and theoretical significance.

## Purpose of Study

The purpose of the present study was to investigate predictors of seventh-grade mathematics achievement. The study focused on the following factors as predictors of mathematics achievement: Iowa Tests of Basic Skills (ITBS) mathematics subtest scores, ITBS mathematics total

scores, Kern High School District Test of Mathematics Achievement (KHSD) scores, sixth-grade mathematics grades, sixth-grade teacher recommendations, and gender. Seventh-grade mathematics achievement was measured by student course grades and an end of the year mathematics achievement test score.

## Method

### Subjects

The study sample consisted of 233 seventh-grade mathematics students in one metropolitan southeastern Idaho junior high school. The seventh-grade mathematics program included eleven classes of four ability groups. The classes consisted of one pre-algebra class, four exploring classes, four general classes, and two basic classes. These classes were taught by five different teachers. Characteristics of the study sample appear in Table 1.

### Context of the Problem

Prior to the school year 1988-89, the junior high school in this study did not have a systematic means of placing students into its ability grouped seventh-grade mathematics program which consisted of four levels. Described below is the method used to ability group the seventh-grade mathematics classes during the 1988-89 academic year.

Table 1

Subject Characteristics

| | Total | Females | Males |
|---|---|---|---|
| Whole Group | 233 | 123 | 110 |
| Pre-algebra Class | 26 | 9 | 17 |
| Exploring Class | 111 | 55 | 56 |
| General Class | 78 | 48 | 30 |
| Basic Class | 18 | 11 | 7 |

In February, 1988 sixth graders took Level 12, Form G of the ITBS. ITBS scores used in this study were reported in terms of local percentile norms. During April, 1988 a seventh-grade mathematics teacher administered the KHSD test to all sixth graders who would be attending the junior high school in this study. KHSD test scores were a percentage of the correct responses. After having access to the ITBS and KHSD test results, sixth-grade teachers recommended a seventh-grade mathematics class for each of their students. Teacher recommendations (TR) were number coded from one to three, with a "1" indicating a remedial class, a "2" an average class, and a "3" a pre-algebra placement. Because of a miscommunication, teacher recommendations reflected only three levels of ability-grouped classes whereas the seventh-grade curriculum had a four level system.

Students were subsequently placed into one of the four ability level classes of seventh-grade mathematics for the school year 1988-89. The cut-off scores for each variable (i.e., ITBS total mathematics score, KHSD test score, and teacher recommendation) established the lower limit for admission to that class. Students were admitted to a particular class, if they were above the cut-off score for two of the three variables.

| CLASS | CUT-OFF SCORES |
|---|---|
| pre-algebra | ITBS 90, KHSD 72, TR 3 |
| exploring | ITBS 50, KHSD 54, TR 2 |
| general | ITBS 30, KHSD 30, TR 2 or 1 |
| basic | none |

At the end of the 1988-89 school year, the principal investigator of this study collected ITBS mathematics subtest scores and sixth-grade mathematics grades from student cumulative folders. Student grades and achievement test scores were obtained from the seventh-grade mathematics teachers.

Instruments

The ITBS scores used in this study were the three mathematics subtest scores (i.e., concepts, problem solving, and computation) and the total mathematics score. The KHSD test was a fifty-item multiple-choice test (with four response choices) consisting primarily of computation questions.

The sixth-grade mathematics grade was the reported grade (i.e., A, B, C, D, F) in the student's cumulative folder. Seventh-grade mathematics grades were the first semester percentage grade and the final grade which was the mean of the first and second semester percentages. Sixth-grade teachers reported a recommendation coded "1" (remedial), "2" (average level), or "3" (pre-algebra).

The final achievement test was a test prepared by the publisher of the mathematics textbook used in the average class. Teachers chose this test because it best represented the seventh-grade objectives, realizing it was too easy for some students and too difficult for others. The test consisted of 50 multiple-choice items with four response choices. The test score was reported as the percentage of correct responses.

Statistical Analysis

Using SPSS-X (1986) Sub-programs, Frequencies and Breakdown, descriptive statistics were first computed for all study variables. Pearson product moment correlations were then computed and multiple regression analyses were subsequently conducted using SPSS-X Subprograms, Pearson Corr and Regression (Stepwise). The multiple regression analysis included only those students for whom all data was available (n = 147).

## Results

### Overall Findings

Mean mathematics subtest and total ITBS mathematics scores by class completed and for the whole group appear in Table 2. These ITBS mean scores show substantial differences between the four ability-grouped mathematics classes. This variation was expected because the ITBS mathematics total score was one of the three criteria used to ability group these students. Additionally, Table 2 includes the mean KHSD test scores. The KHSD was also a grouping criterion and therefore the mean scores, as expected, reflect marked differences between classes.

Sixth-grade mathematics grades and gender were two variables not used to establish the four ability-grouped mathematics classes. Sixth-grade mathematics grades and gender values are also shown in Table 2. Like the ITBS scores and the KHSD test, the mathematics report card grades vary substantially between the four classes. The value of 1.50 for the gender variable in the exploring class indicates an equal number of boys and girls (females were coded with a "1" and males with a "2"). The pre-algebra class contained more boys; whereas, the lower ability classes, general and basic, contained more girls.

Table 2

Class Means for Selected Variables

| | ITBS Concepts | ITBS Problem Solving | ITBS Computation | ITBS Total | Teacher Recommendation | EHSD Test | Sixth-Grade Mathematics | Gender |
|---|---|---|---|---|---|---|---|---|
| Whole Group | 62.34 (24.59) | 56.03 (27.33) | 53.71 (29.34) | 59.19 (27.04) | 1.83 (.60) | 55.62 (15.80) | 2.94 (.87) | 1.47 (.50) |
| Pre-algebra | 89.95 (8.52) | 90.32 (7.29) | 86.55 (15.17) | 91.65 (6.32) | 2.48 (.51) | 78.56 (9.75) | 3.74 (.54) | 1.65 (.49) |
| Exploring | 72.19 (18.38) | 67.39 (20.43) | 66.03 (24.70) | 71.73 (19.06) | 2.05 (.32) | 62.69 (10.22) | 3.21 (.65) | 1.51 (.50) |
| General | 48.69 (17.98) | 37.46 (17.60) | 34.51 (18.33) | 39.97 (15.26) | 1.39 (.53) | 44.93 (8.35) | 2.54 (.79) | 1.39 (.49) |
| Basic | 25.00 (21.05) | 20.40 (22.49) | 17.07 (16.04) | 16.86 (20.94) | 1.10 (.32) | 31.54 (6.33) | 1.73 (.96) | 1.39 (.50) |

Note. Numbers in parentheses are standard deviations.

The mean scores by class completed for the criteria variables are shown in Table 3. The mean student grades indicate an approximate five percentage point increase when going from the remedial (basic), to general, to exploring, to the advanced (pre-algebra) class. Even though course content was adjusted for mathematical ability and background, more advanced students tended to earn higher grades and visa versa. The mean scores for the final achievement test show approximately the same differences as for the ITBS and KHSD scores.

Correlations

The correlation matrix for all study variables appears in Table 4. Correlations between the sixth-grade study variables were all significant ($p < .001$) and in the .47-.92 range. All correlations between the seventh-grade study variables were significant ($p < .001$) and in the .28-.81 range. Correlations between sixth and seventh-grade variables were also all significant ($p < .001$) and ranged from .28-.81.

Table 3

Seventh-Grade Grades and Final Test Means By Class

| | First Semester Grade | Final Grade | Final Test |
|---|---|---|---|
| Whole Group | 78.67 (14.58) | 77.92 (13.66) | 69.55 (16.69) |
| Pre-algebra | 87.62 (5.51) | 88.50 (4.97) | 87.08 (9.79) |
| Exploring | 80.06 (12.59) | 77.83 (12.68) | 76.49 (11.95) |
| General | 75.63 (15.65) | 76.51 (14.11) | 60.59 (11.15) |
| Basic | 69.29 (21.69) | 68.24 (17.28) | 39.89 (9.11) |

Note. Numbers in parentheses are standard deviations.

Table 4

Correlations Between Study Variables

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. ITBS Concepts | | | | | | | | | | |
| 2. ITBS Problem Solving | .79 (.000) | | | | | | | | | |
| 3. ITBS Computation | .64 (.000) | .66 (.000) | | | | | | | | |
| 4. ITBS Total Mathematics | .90 (.000) | .92 (.000) | .84 (.000) | | | | | | | |
| 5. EHSD Test | .72 (.000) | .72 (.000) | .76 (.000) | .81 (.000) | | | | | | |
| 6. Teacher Recommendation | .51 (.000) | .56 (.000) | .54 (.000) | .59 (.000) | .64 (.000) | | | | | |
| 7. Sixth-Grade Mathematics | .48 (.000) | .47 (.000) | .50 (.000) | .56 (.000) | .53 (.000) | .66 (.000) | | | | |
| 8. Gender | .15 (.015) | .12 (.047) | .03 (.355) | .11 (.057) | .09 (.120) | .05 (.250) | -.02 (.413) | | | |
| 9. Seventh-Grade First Semester | .36 (.000) | .29 (.000) | .35 (.000) | .36 (.000) | .33 (.000) | .33 (.000) | .48 (.000) | -.16 (.008) | | |
| 10. Seventh-Grade Final Grade | .41 (.000) | .35 (.000) | .37 (.000) | .41 (.000) | .37 (.000) | .36 (.000) | .52 (.000) | -.15 (.012) | .94 (.000) | |
| 11. Final Achievement Test | .77 (.000) | .73 (.000) | .68 (.000) | .81 (.000) | .78 (.000) | .56 (.000) | .61 (.000) | .08 (.117) | .52 (.000) | .55 (.000) |

Note. Numbers in parentheses are p levels.

Gender correlated significantly ($p < .05$) with the ITBS concepts and problem solving subtest scores. The correlation coefficients, .15 and .12 respectively, indicate that males tended to perform better on these subtests than females. Gender also correlated significantly with the seventh-grade first semester percentage grade and the final percentage grade. These correlation coefficients, -.16 and -.15, indicated that seventh-grade girls tended to receive better grades than seventh-grade boys.

Predictors

The results of the multiple regression analysis investigating the predictors of seventh-grade first semester mathematics grades appear in Table 5. Seven variables contributed significantly ($p < .05$) to the prediction of seventh-grade first semester grades. After correction for possible biased overestimation because the study sample was less than 50 times the number of predictors (Glass & Hopkins, 1984), approximately 26% of the variance in seventh-grade first semester mathematics percentage grades was accounted for by the composite set of seven predictors.

Table 5

Multiple Regression Analysis:

Seventh-Grade First Semester Grade

| | Independent Variables | B | R | $R^2$ |
|---|---|---|---|---|
| STEP 1 | sixth-grade mathematics grade | 7.370 | .502 | .252 |
| | additive constant | 50.714 | | |
| STEP 2 | sixth-grade mathematics grade | 7.270 | .531 | .283 |
| | gender | -4.387 | | |
| | additive constant | 65.607 | | |
| STEP 3 | sixth-grade mathematics grade | 6.429 | .548 | .300 |
| | gender | -4.665 | | |
| | ITBS problem solving | -0.044 | | |
| | teacher recommendation | -0.040 | | |
| | ITBS computation | 0.066 | | |
| | ITBS concepts | 0.079 | | |
| | EHSD test | -0.076 | | |
| | additive constant | 66.705 | | |

Corrected R .514
Corrected $R^2$ .265

The results of the multiple regression analysis investigating the predictors of seventh-grade final mathematics grades appear in Table 6. The same seven variables contributed significantly ($p < .05$) to the prediction of seventh-grade final semester grades as for first semster grades. After correction, approximately 31% of the variance in seventh-grade final percentage grades was accounted for by the composite set of predictors.

The results of the multiple regression analysis investigating the predictors of seventh-grade final achievement test scores appear in Table 7. Eight variables contributed significantly ($p < .05$) to the prediction of seventh-grade final achievement test scores. After correction, approximately 71% of the variance in seventh-grade final achievement test scores was accounted for by the composite set of predictors.

## Conclusions

The purpose of this study was to investigate predictors of seventh-grade mathematics achievement. A review of the research revealed that few studies had focused specifically on seventh-grade mathematics. Additionally, the seventh-grade mathematics course now largely determines the amount of mathematics a student completes in high school.

Table 6

Multiple Regression Analysis:

Seventh-Grade Final Grade

| | Independent Variables | B | R | $R^2$ |
|---|---|---|---|---|
| STEP 1 | sixth-grade mathematics grade | 7.374 | .532 | .283 |
| | additive constant | 57.826 | | |
| STEP 2 | sixth-grade mathematics grade | 7.277 | .560 | .314 |
| | gender | -4.221 | | |
| | additive constant | 64.445 | | |
| STEP 3 | sixth-grade mathematics grade | 5.900 | .583 | .340 |
| | gender | -5.443 | | |
| | ITBS concepts | 0.101 | | |
| | additive constant | 63.931 | | |
| STEP 4 | sixth-grade mathematics grade | 6.143 | .587 | .344 |
| | gender | -5.283 | | |
| | ITBS concepts | 0.124 | | |
| | teacher recommendation | -0.479 | | |
| | ITBS computation | 0.028 | | |
| | ITBS problem solving | -0.017 | | |
| | KHSD test | -0.063 | | |
| | additive constant | 65.290 | | |

Corrected R .558
Corrected $R^2$ .311

Table 7

Multiple Regression Analysis:

Final Achievement Test

| | Independent Variables | B | R | $R^2$ |
|---|---|---|---|---|
| STEP 1 | ITBS total mathematics | .440 | .788 | .621 |
| | additive constant | 42.248 | | |
| STEP 2 | ITBS total mathematics | .374 | .828 | .686 |
| | sixth-grade mathematics grade | 5.437 | | |
| | additive constant | 31.944 | | |
| STEP 3 | ITBS total mathematics | .260 | .843 | .710 |
| | sixth-grade mathematics grade | 4.657 | | |
| | KHSD test | .272 | | |
| | additive constant | 25.779 | | |
| STEP 4 | ITBS total mathematics | .137 | .848 | .719 |
| | sixth-grade mathematics grade | 4.607 | | |
| | KHSD test | .282 | | |
| | ITBS concepts | .150 | | |
| | additive constant | 23.218 | | |
| STEP 5 | ITBS total mathematics | -0.005 | .852 | .726 |
| | sixth-grade mathematics grade | 5.360 | | |
| | KHSD test | 0.281 | | |
| | ITBS concepts | .192 | | |
| | gender | 1.723 | | |
| | teacher recommendation | -2.198 | | |
| | ITBS computation | .063 | | |
| | ITBS problem solving | .064 | | |
| | additive constant | 21.203 | | |

Corrected R .842
Corrected $R^2$ .710

Therefore, data consisting of eight independent variables (i.e., ITBS concepts subtest scores, ITBS problem solving subtest scores, ITBS computation subtest scores, ITBS total mathematics scores, KHSD test scores, teacher recommendations, sixth-grade mathematics grades, and gender) and three dependent variables (i.e., seventh-grade first semester percentage grades, seventh-grade final percentage grades, and seventh-grade achievement test scores) were collected for students enrolled in seventh-grade mathematics courses at one junior high school. The data analysis consisted of descriptive statistics, Pearson product moment correlation coefficients, and multiple regression analyses.

All independent variables, except gender, correlated significantly ($p < .001$) with all three criteria. The sixth-grade mathematics report card grade showed the highest correlation with the seventh-grade first semester percentage grade, .48, and with the final percentage grade, .51. The ITBS total mathematics score correlated best with the final achievement test, .80. The seventh-grade semester and final grades showed a significant ($p < .05$) correlation of -.16 with gender; indicating females tended to receive better grades than males.

The results of the multiple regression analysis showed all variables except the ITBS total mathematics score correlated significantly with the seventh-grade first semester percentage grade. After correction for sample size, about 26% of the variance in seventh-grade first semester grades was accounted for by the composite set of seven predictors. About 31% of the variance in seventh-grade final percentage grades was accounted for by the same composite set of predictors. All eight predictor variables contributed significantly to the prediction of the seventh-grade achievement test scores. This composite set of eight predictors accounted for about 71% of the variance in achievement test scores.

## Discussion

In this study of predictors for seventh-grade mathematics success, the assumption was made that seventh graders in this study were representative. The correlations of the ITBS subtest scores support this assumption. The Preliminary Technical Summary for the ITBS reported correlations between subtests from .61-.77 (Hieronymus & Hoover, 1986b, p. 35). Correlations from the present study for ITBS subtests ranged from .64-.79. Another indication that the junior high studied was representative is the range of scores found on the mathematics sections of the ITBS. The total mathematics scores ranged from the 1st to the 99th percentile with a mean of 59.19.

Another assumption made in the present study was differences in teachers' grading procedures, teaching methods, and resources would not skew the results. Correlations of previous mathematics grades with current mathematics grades reported in other studies ranged from .37 (Flexer, (1984) to .68 (Rothenberger, 1967). These correlations were similar to the .48 and .52 correlation of sixth-grade mathematics grades with seventh-grade mathematics grades found in the present study. However, the higher correlation of the sixth-grade mathematics grades with the seventh-grade achievement test scores,

.61, than the seventh-grade mathematics grades with the seventh-grade achievement test scores, .52-.55 may indicate the grading procedures of seventh grade teachers had an effect on the results.

Furthermore, the seventh-grade mathematics classes were ability grouped. The assumption was made that this grouping would not affect the results. Separate correlational studies for each of the four ability grouped classes (i.e., pre-algebra, exploring, general, and basic) were obtained as part of the initial data analysis for this study. Correlation coefficients for the exploring class, the only class with sufficient numbers to obtain significant results, were similar to the whole group study. Thus, this partial data may indicate the ability grouping had little effect on the results of this study.

## Implications

### Prediction of Mathematics Achievement

The results from this study are consistent with other correlation studies of mathematics achievement and cognitive predictor variables. The .48 and .52 correlations of sixth-grade mathematics grades with seventh-grade mathematics grades, first semster and final grade, are similar to results found by Barnes & Asher (1962), Hanna, et al. (1969), and Rothenberger (1967) in

studies involving correlations of eighth-grade mathematics grades with ninth-grade algebra grades.

The correlation coefficient of .80 for the ITBS total mathematics score with the seventh-grade mathematics achievement test was about the same as the .78 correlation of an algebra prognosis test with an algebra achievement test in a study by Hanna, et al (1969). However, the ITBS total mathematics score correlation with the seventh-grade mathematics achievement test from this study was considerably higher than the .28-.42 correlation of the Metropolitan Achievement Test mathematics subtest scores with algebra achievement test found by Flexer (1984).

In the present study, the variance in seventh-grade grades accounted for by the multiple regression equation was about 30%. The variance accounted for in the final achievement test score by a different multiple regression equation was 71%. Multiple regression analyses predicting algebra grades and algebra achievement test scores in other studies (Barnes & Asher, 1962; Flexer, 1984; Hanna et al, 1969; Mogull & Rosengarten; and Siglin & Edeburn, 1978) range from about 32% to 64%.

Therefore, a defensible argument is that predicting seventh-grade mathematics grades from sixth-grade variables is not much different that predicting other mathematics course grades from previous mathematical

performance. However, a wider range of correlations exist if achievement tests are used as criteria. Consequently, the prediction of mathematics achievement test scores may be more variable among studies than the prediction of grades and more dependent on the particular test content.

Grading Systems

Implications for grading derive from the results of this study. The grading procedures used by the seventh-grade teachers varied from weighting the homework 0% to 50% and the tests 50% to 100%. This lack of consistency may affect the results of this study. A more consistent grading procedure would probably impact the correlations involved with seventh-grade mathematics grades. If greater emphasis were given to classroom tests compared to homework, then correlations of the seventh-grade grades with the achievement test scores would probably be higher because of the similarity between the content and format of published achievement tests and classroom tests. The class grade would already reflect skills as measured by tests compared to skills measured by homework completion if less emphasis was given to test results in the grading system. A suggestion for teachers is that classes of the same ability group have the same grading procedure to insure the grade more nearly reflects

the same skill level. Consistent grading procedures between ability groups would not be so important because the course content would most often be different.

Ability Grouping

The ability grouping system for 1988-89 used the ITBS total mathematics test score, the KHSD test score, and teacher recommendation to place students into the four different seventh-grade mathematics classes. Apparently, the use of the KHSD test is redundant. Correlations of the KHSD scores with all criteria are lower than the correlations with the ITBS total mathematics score. Instead, the sixth-grade mathematics grade should be part of the placement system because it shows the highest correlation with seventh-grade mathematics grades and the second highest correlation with the final achievement test scores. Furthermore, the ITBS total mathematics score should be retained as a placement measure. It showed the highest correlation with the achievement test scores and the second highest correlation with seventh-grade mathematics grades. Teacher recommendations showed lower correlations than the ITBS subtest scores. Thus results of the present study indicate teacher recommendations are of less value than other predictor variables investigated.

The multiple regression analyses revealed all predictor variables contributed significantly to the

prediction of the seventh-grade mathematics achievement test scores and all predictor variables, except the KHSD total mathematics score, contributed to the prediction of seventh-grade grades. However, use of all the study variables would be too complicated and time consuming to be of practical value.

Therefore, additional research should be done to determine if the cut-off scores used for grouping students did effectively minimize changes between the four ability grouped classes. A discriminant analysis could also be conducted to determine which independent variables best predicted completion of each of the four classes. Because only 30-70% of the variance in mathematics achievement was accounted for by the study variables, consideration should be given to having the sixth-grade teacher recommendation reflect variables other than academic which other studies have found to affect mathematics achievement (Holly & Michael, 1972; Lehrer, 1977; Smead & Chase, 1981; Tsai & Walberg, 1983).

According to the results of this study, any ability grouping system that simply takes students and divides them into three or four groups of equal numbers and provides differentiated curriculm could not be justified. The large differences in the percentage of students who completed each of the four ability-grouped classes

substantiates this finding. Of the 233 students surveyed, 11.2 % completed pre-algebra, 47.6% exploring, 33.5% general, and 7.7% basic. These percentages do not come close to an equal distribution of 25% in each ability group. Therefore, each school needs to use available cognitive data about students' mathematical skills to determine how many classes of each ability level are needed and to determine where students should be placed.

A final recommendation derived from the results of this present study is each school district should follow a group of seventh graders through their secondary mathematics career. Data needs to be collected regarding who takes what mathematics courses and how many. Changes in who drops out of accelerated programs after seventh grade need to be documented and reasons for these changes need to be found. These reasons for movement out of an accelerated tract may be similar to those found by Sharp (1975) which included failure to understand what was going on in class, low grades in the accelerated program, work which was too difficult, or progression of the class was too rapid. Likewise, characteristics of students who move from remedial to average or to above average courses need to be collected. Thus, by following a group of seventh graders through their high school mathematics career, the

school district could obtain clues to weaknesses in its curriculum, teachers, or counseling.

## Summary

Completing this study which sought to predict seventh-grade mathematics success was initially thought to be significant because high attrition rates had been found in accelerated mathematics programs which had not established criteria for admission (Sharp, 1975; Wheatley, 1988). Because seventh graders have the option to take pre-algebra, the first step in an accelerated mathematics program, research was needed to establish predictors of seventh-grade mathematics success. The small numbers of students enrolled in pre-algebra in this sample did not enable a statistically significant prediction of success in pre-algebra. However, prediction of mathematics success for the entire sample did provide some guidelines for prediction of pre-algebra success.

Secondly, prediction of mathematics success was needed for all seventh-grade mathematics students because the junior high school in this study like most secondary schools (Crosswhite, et al. 1985; Oakes, 1985) has an ability-grouped mathematics program. The present study established predictors of success in seventh-grade mathematics which will be useful to counselors and teachers who are involved in placing seventh-grade

students into an appropriate ability group for mathematics instruction. Additionally, the results of this study which show the relative predictability of eight variables (i.e., ITBS concepts subtest scores, ITBS problem solving subtest scores, ITBS computation subtest scores, ITBS total mathematics scores, KHSD test scores, teacher recommendations, sixth-grade mathematics grades, and gender) for success in seventh-grade mathematics can be used to help parents and students understand and participate in decisions regarding the student's appropriate placement in a seventh-grade ability-grouped mathematics program.

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